Topic: Finding sine given cosine, or vice versa

Question: Choose the best approximation.

If $\cos(138^\circ) = -0.743$, which of the following most closely approximates the value of $\sin(138^\circ)$?

Answer choices:

A 0.228

B -0.669

C -0.228

D 0.669

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Solution: D

Since we know the value of $\cos(138°)$ and we want to determine the value of $\sin(138°)$, we'll use the equation

$$\sin^2(138°) = 1 - \cos^2(138°)$$

Substituting the value of $\cos(138°)$, we obtain

$$\sin^2(138°) = 1 - (-0.743)^2$$

Now $(-0.743)^2 \approx 0.552$, so

$$\sin^2(138°) \approx 1 - 0.552$$

$$\sin^2(138°) \approx 0.448$$

From this it follows that either

$$\sin(138°) \approx \sqrt{0.448}$$

or

$$\sin(138°) \approx -\sqrt{0.448}$$

Note that the terminal side of $138°$ lies in the second quadrant, because

$$90° < 138° < 180°$$

Also, recall that the y-coordinate of every point in the second quadrant is positive. Therefore,

$$\sin(138°) \approx \sqrt{0.448}$$

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Taking the square root of 0.448, we find that

$$\sin(138^\circ) \approx 0.669$$

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Topic: Finding sine given cosine, or vice versa

Question: Find the value.

What is the value of $\cos(-329°)$ if $\sin(-329°) = 0.515$?

Answer choices:

A -0.647

B 0.647

C -0.857

D 0.857

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Solution: D

We know the value of $\sin(-329°)$, and we want to determine the value of $\cos(-329°)$, so we'll use the equation

$$\cos^2(-329°) = 1 - \sin^2(-329°)$$

Substituting the value of $\sin(-329°)$, we get

$$\cos^2(-329°) = 1 - (0.515)^2$$

Since $(0.515)^2 \approx 0.265$, we have

$$\cos^2(-329°) \approx 1 - 0.265$$

$$\cos^2(-329°) \approx 0.735$$

This means that either

$$\cos(-329°) \approx \sqrt{0.735}$$

or

$$\cos(-329°) \approx -\sqrt{0.735}$$

The terminal side of an angle of $-329°$ lies in the first quadrant, because

$$-360° < -329° < -270°$$

Since the x-coordinate of every point in the first quadrant is positive,

$$\cos(-329°) \approx \sqrt{0.735}$$

Taking the square root of 0.735, we obtain

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$\cos(-329°) \approx 0.857$

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Topic: Finding sine given cosine, or vice versa

Question: Find the value.

If the measure of an angle θ, in radians, is $6\pi/5$ and $\sin\theta = -0.588$, what is the value of $\cos\theta$?

Answer choices:

A -0.809

B 0.998

C 0.809

D -0.998

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Solution: A

We're given the value of $\sin(6\pi/5)$, and we want to compute the value of $\cos(6\pi/5)$ from it, so we'll use the equation

$$\cos^2\left(\frac{6\pi}{5}\right) = 1 - \sin^2\left(\frac{6\pi}{5}\right)$$

Substituting the value of $\sin(6\pi/5)$, we have

$$\cos^2\left(\frac{6\pi}{5}\right) = 1 - (-0.588)^2$$

Now $(-0.588)^2 \approx 0.346$, so

$$\cos^2\left(\frac{6\pi}{5}\right) \approx 1 - 0.346$$

$$\cos^2\left(\frac{6\pi}{5}\right) \approx 0.654$$

Thus either

$$\cos\left(\frac{6\pi}{5}\right) \approx \sqrt{0.654}$$

or

$$\cos\left(\frac{6\pi}{5}\right) \approx -\sqrt{0.654}$$

The terminal side of an angle of $6\pi/5$ (radians) lies in the third quadrant, because

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$$\pi = \frac{5\pi}{5} < \frac{6\pi}{5} = \frac{12\pi}{10} < \frac{15\pi}{10} = \frac{3\pi}{2}$$

Since the x-coordinate of every point in the third quadrant is negative,

$$\cos\left(\frac{6\pi}{5}\right) \approx -\sqrt{0.654}$$

Taking the square root of 0.654, we obtain

$$\cos\left(\frac{6\pi}{5}\right) \approx -0.809$$

That is,

$$\cos\theta \approx -0.809$$

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